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BASE MATERIAL FOR GROWING PLANTS
[Shokubutsu Saibai Kizai]

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SPECIFICATION

1. Title

Base Material for Growing Plants

2. Claims

(1) A base material for growing plants that has peat as the major structural component and that is prepared by blending a water-resistant emulsion-type adhesive into the peat so as to form spot adhesion and by forming the mixture by compression molding.

(2) The base material for growing plants stated in Claim 1, wherein seeds are embedded in advance.

(3) A base material for growing plants that has peat as the major structural component and that is prepared by blending a water-resistant emulsion-type adhesive into the peat so as to form spot adhesion, by further blending bed soil for raising seedlings into the mixture, and by forming the mixture by compression molding.

(4) The base material for growing plants stated in Claim 3, wherein 50 to 70% bed soil for raising seedlings is added to 30 to 50% peat into which an emulsion-type adhesive has been blended.

(5) The base material for growing plants stated in Claim 3, wherein seeds are embedded in advance.

* Number in the margin indicates pagination in the foreign text.

3. Detailed Description of the Invention

[Industrial Field of Application]

The present invention pertains to a base material for growing plants; in particular, to a base material for growing plants that has peat as the major structural component, that is prepared by blending a water-resistant emulsion-type adhesive into the peat so as to form spot adhesion and, if desired, by further blending bed soil for raising seedlings, and that can be rehydrated by adding water to it. It further pertains to a base material used for germination and cultivation of plants that has seeds embedded beforehand.

[Prior Art]

It is a widely known practice to use compression-molded peat products as base materials for cultivating plants and raising seedlings. These base materials are compact and easy to carry, and they are quickly rehydrated by adding water at the time of use and become cultivation soil having excellent water retention and breathability, thus rendering themselves useful for a wide range of industrial applications.

There are two known production methods of compression-molded peat products, that is, a wet method and dry method, and they are selectively used according to applications. However, in either method, improving the shape retention of base materials in rehydration is a /90

serious challenge. If a base material has poor shape retention, the base material could dissolve away with water when water is added to it.

As attempts to solve this shortcoming, various methods have been proposed, including a method that covers the sides of a peat material with a net-shaped material and a method that uses adhesives or asphalt emulsions to bind peat fibers together.

These methods, however, are still left with some problems—for example, their production methods are troublesome, they interfere with the rehydration of peat, or they are not cost effective—and neither of these methods has achieved satisfactory effects.

Meanwhile, when peat is used but its mixing ratio is low, as is the case with seedling-raising bed soils for vegetables, flowers, rice plants, etc., it is difficult to solidify them by conventional methods.

With respect to the preparation of compression-molded peat products in which seeds are embedded, the aforesaid prior-art methods sow seeds on a molded product, further cover them with peat, and subsequently mold the entire structure. Because this molding requires a considerably high pressure, it causes compression breakdown or deterioration of the seeds; therefore, it is difficult to mold in one step at once. Accordingly, it is a common practice to form small holes for seeding use on the upper surface of compression-molded peat products and to insert seeds when the products are used.

[Object of the Invention]

The object of the present invention is to provide a base material for growing plants that does not have the aforesaid shortcomings, and, in essence, it is a base material for growing plants that has peat as the major structural component and that is prepared by blending a water-resistant emulsion-type adhesive into the peat so as to form spot adhesion and, if desired, by further blending bed soil for raising seedlings, and it is also the aforesaid base material that has seeds embedded beforehand.

The plant-cultivation base material of the present invention is rehydrated while retaining its shape when water is supplied to it, thus rendering itself highly useful for germination/cultivation of plants.

[Configuration of the Invention]

In the plant-cultivation base material of the present invention, the emulsion-type adhesive that is blended into peat so as to form spot adhesion has a configuration in which a hydrophobic polymer compound is dispersed in water in the form of microscopic particles. When an appropriate quantity of this emulsion is sprayed over peat, the peat absorbs water molecules. Therefore, the microscopic particles are distributed on the peat fibers or on peat particles in the form of spots.

Therefore, in the spray-application process and the subsequent dryness-control process, the microscopic particles on the peat fibers

or peat particles exhibit adhesion, and the peat fibers or peat particles make spot-contact among themselves and bond together. Furthermore, in the subsequent compression-molding process, the formed adhesion layer is further fortified owing to the pressure-sensitive adhesion property of the adhesive. In addition, in this compression process, the adhesive layer that has not been involved in the adhesion in the spraying/drying processes forms an adhesion layer between nearby fibers or particles, thereby realizing stronger adhesion as a whole.

In the aforesaid mechanism, it is essential for the initial adhesion in the peat in the spray-application process and the drying process to progress in the form of spot adhesion. The reason for this is that the rehydration property of the base material at the time of water addition is achieved by loosely adhering the peat in these processes and then by compressing it.

To promote the aforesaid initial adhesion, a binder with excellent adhesion is required. Therefore, thermoplastic polymer compounds with no adhesion or asphalt emulsions with weak adhesion are not suitable for this purpose.

Some examples of the adhesive used in the plant-cultivation base material of the present invention include natural-rubber-based, synthetic-rubber-based, or synthetic-resin-based (acrylic resins, ethylene vinyl acetate resins, etc.) emulsion-type adhesives.

Another feature of the present invention is that the use of an adhesive with an excellent pressure-sensitive adhesion property makes it possible to obtain a molded product having sufficient physical strength even if a low compression force is used for the molding.

As a consequence, the present invention makes it possible to efficiently form a molded product in which the base material and seeds are formed in one piece by compressing plant seeds and peat simultaneously.

In the case of adding/blending bed soil to peat into which an adhesive has been blended in advance, the adhesive increases the bonding sites, and the bed soil is dispersed in the peat that is entangled in a 3D form; as a result, the bed soil can retain its shape well. /91

The blending proportion of peat and bed soil is not limited in any specific way as long as it is set to a condition that is suitable for the germination and growth of plant seeds, but, from the standpoint of efficient shape retention of the cultivation base material, it is advantageous to set the proportion to 30 to 50% of the peat to 50 to 70% of the bed soil.

If the blending proportion of the peat is 30% or less, good shape retention cannot be attained, and, since a blending proportion of 30 to 50% satisfies the shape-retention requirement well, there is no need to blend any more than 50%, and doing so is not desirable from the standpoint of cost effectiveness.

The following explains in further detail the base material for growing plants pertaining to the present invention.

On peat moss--for example, commercially available Finnish sphagnum peat moss having a content of 10 to 50%--is sprayed an acrylic-based emulsion-type adhesive. If the water content exceeds 50% here, the absorption of water in the emulsion by the peat is inhibited; as a result, desired adhesion cannot be obtained.

It is possible to incorporate inorganic powder or granules of zeolite, vermiculite, perlite, etc., together with peat moss. Furthermore, it is also possible to mix commercially available chemical fertilizers, such as ammonium sulfate, urea, superphosphate of lime, fused magnesium phosphate, potassium chloride, etc., and, if necessary, such trace elements as Fe, Mg, B, Mn, Cu, Zn, etc., as well as growth promoters (dried microorganism or fungi, such as leguminous bacteria, mycorrhizal fungi, etc.) and plant hormones (cytokinin, brassinolide, etc.)

By blending these materials into peat moss to which an emulsion-type adhesive has been added, it becomes possible to handle various fertilizer application designs, and the peat moss is expected to have the effect of weight reduction and the effect of imparting breathability to seedling-raising bed soil, thereby providing an ideal environment for root growth.

Furthermore, because the adhesive blended into peat moss also promotes the bonding of these materials, the shape retention at the time of rehydration improves dramatically.

According to the present invention, seedling-raising bed soil into which necessary ingredients have been blended can be mixed and compressed with the base material. In this case, the bed soil is given an excellent handling property as well as an appropriate rehydrating property and shape-retaining property when water is supplied. Especially when bed soil for rice plants is mixed, weight reduction can be achieved in addition to these effects, which fact greatly contributes to the improvement of the operability of machine planting of seedlings.

The blending quantity of the adhesive varies depending on the physical property of the adhesive, the characteristics of the employed peat, and so forth, but it is usually in a range from 5% to 15% based on the peat in terms of dry weight. If the adhesive is used in an excessive quantity, the adhesive will cover the entire peat and inhibit rehydration.

After the adhesive is applied by spraying, excess moisture is evaporated so as to set the total water content to a range from 10% to 20%. The resulting product is packed in a given mold and compression molded. The compression pressure is in a range from 10 to 100 kg/cm^2.

In the case of preparing a molded product into which plant seeds are embedded, after peat that has been prepared as described in the

foregoing is packed in a mold, seeds are sowed over it and further covered with the processed peat in a thickness corresponding to approximately three times the diameter of the seeds, after which compression molding is carried out.

[Test Examples and Working Examples]

The following explains the present invention in more concrete terms by presenting test examples and working examples.

Test Example-1

The rehydration property of the plant-cultivation base material of the present invention was tested as follows.

After Finnish sphagnum peat moss having a 50% water content was fibrillated, it was dried in the sun to set the water content to approximately 30%, and, in a fluidized-bed drier, 10% of an ethylene vinyl acetate resin emulsion having a 50% solid content was added to it, and the mixture was dried until the water content reached 10 to 13%.

This dried product was weighed and packed in a mold and compression-molded for 5 seconds at 30 kg/cm^2, thereby obtaining a base material that was 60 mm wide, 60 mm long, and 10 mm high.

This base material was placed in a Petri dish, and water was added to the Petri dish up to the height (10 mm) of the base material for conducting a rehydration test on the base material. The results are set forth in attached Figs. 1 and 2.

Fig. 1 is a graph indicating the rehydration condition in the height direction, and Fig. 2 in the length direction. When four minutes elapsed after the pouring of water over the base material, the base material was rehydrated, increasing its height from 10 mm to 19 mm (Fig. 1) and its length from 60 mm to 66 mm (Fig. 2), but, thereafter, no increase was observed either in its height or length, /92 thus clearly indicating that the base material can retain its shape well while it is rehydrated.

Test Example-2

After Finnish sphagnum peat moss having a 50% water content was fibrillated, it was dried in the sun to set the water content to approximately 30%, and, in a fluidized-bed drier, 10% of an ethylene vinyl acetate resin emulsion having a 50% solid content was added to it, and the mixture was dried until the water content reached 13.5%.

To 400 g of this dried product was added and dispersed 880 g of commercially available bed soil for raising rice plant seedlings, after which the mixture was packed in a 280 X 580 mm mold and compressed for 5 seconds under a pressure of 30 kg/cm^2, thereby obtaining a light-weight, plate-like product whose density was 0.80 g/cm^2 and whose thickness was 10 mm.

This plate-like product was placed in a rice-seedling-cultivation box and rehydrated by adding water. The results are shown in Fig. 3. The height increased from 10 mm to 15 mm in 4 to 5 minutes, but the swelling did not continue after that, and the shape was stable.

Working Example 1

After Finnish sphagnum peat moss having a 50% water content was fibrillated, it was dried in the sun to set the water content to approximately 30%, and, in a fluidized-bed drier, 10% of an ethylene vinyl acetate resin emulsion was added to it, and the mixture was dried until the water content reached 13.5%.

To this dried product were added fertilizers, and 14 g each of this mixture was packed in 60 mm x 60 mm x 10 mm molds. Over one of the packed products, 25 tomato seeds were sowed, and 25 cabbage seeds were sowed over the other packed product, after which the processed peat moss in the weight that corresponds to 10% of the weight of the packed products was added as the cover soil. This structure was compression-molded for 5 seconds at 30 kg/cm^2, thereby obtaining a plant-cultivation base material according to the present invention.

Germination tests were performed in a hot house on the base materials in which tomato and cabbage seeds were embedded. The results of the germination conditions observed twelve days later are shown in Table 1 below.

TABLE 1

	Germination No. (Abnormal Germination No.)			Normal Germination Rate			
	1	2	3	1	2	3	Average
Tomato	25(1)	25(0)	25(1)	96	100	96	97.3
Cabbage	14(0)	20(0)	23(1)	56	80	88	74.7

The germination rate of tomato seeds was excellent. The germination rate of cabbage seeds was also normal, but, since their

germination took place at the side surfaces of the base material, there is a sufficient possibility for improving the germination rate by studying the sowing position in the base material.

<u>Working Example-2</u>

Unhusked rice that had been pretreated according to a conventional method was sowed according to a conventional seeding method over the plate-shaped product prepared and rehydrated in Test Example-2 and covered with soil, thereby performing germination/growth tests. The results are shown in Table 2. The germination rate after 3 days and the growth condition after 47 days were both found to be comparable to those of the case in which bed soil alone was used.

TABLE 2 /93

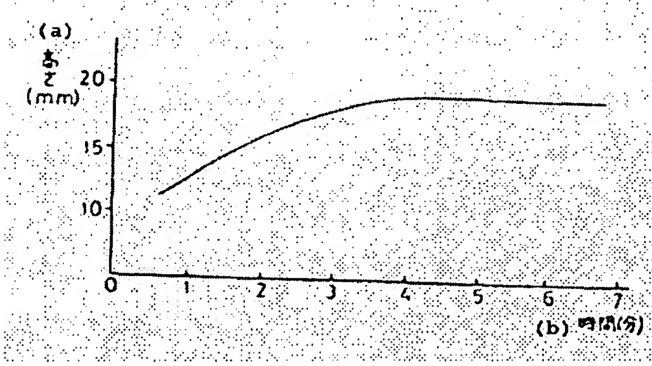
	Germination No. (grains)			Germination Rate (%)				Plant height (cm) Average of 10 plants after 47 days
	1	2	3	1	2	3	Average	
Prior-art base	49	50	49	98	100	98	98.7	15.2
Present invention	50	50	47	100	100	94	98.0	15.4

4. Brief Explanation of the Drawings

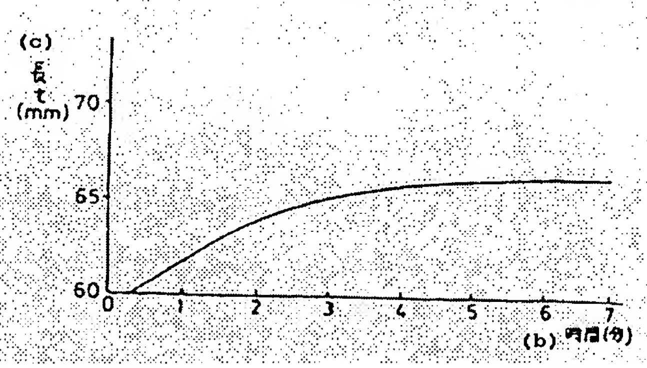
Among the attached drawings, Fig. 1 is a graph that illustrates the rehydration property in the height direction of the plant-cultivation base material of the present invention, Fig. 2 is a graph that illustrates the rehydration property in the length direction of the plant-cultivation base material of the present invention, and Fig. 3 is a graph that illustrates the rehydration property in the height

direction of the plant-cultivation base material in which bed soil is blended according to the present invention.

[FIG. 1]



[FIG. 2]



Key: a) height; b) time (in minutes); c) length.

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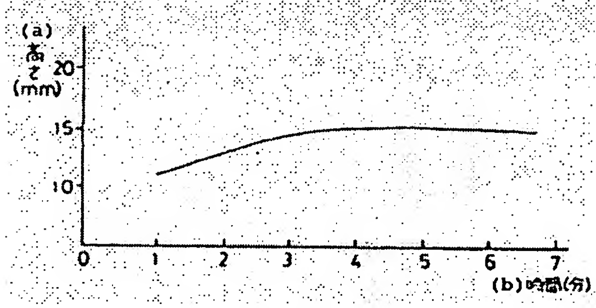
[FIG. 3]



Key: a) height; b) time (in minutes).